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FINAL REPORT

GRANT # N00014-89-J-3047

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PRINCIPAL INVESTIGATOR: Leo W. Buss

INSTITUTION: Yale University

REPORTING PERIOD: 1 July 1989 - 30 June 1992

OBJECTIVE: To determine the transmission dynamics of cnidarian allorecognition using standard breeding experiments and to identify, isolate, and clone the genes controlling allorecognition using molecular methods.

ACCOMPLISHMENTS and SIGNIFICANCE: Our work to date has demonstrated the existence of no less than three additional allorecognition segregant classes in F1 offspring of *Hydractinia echinata*. These results essentially obviate all prior interpretations of the genetics of cnidarian allorecognition as grossly oversimplified. In addition, the laboratory has (see references below) (1) reported the first homeoboxes from cnidarians, (2) used mtDNA conformation to demonstrate that Anthozoa are the primitive cnidarian class, (3) used rDNA sequence to establish that king crabs are derived from hermit crabs, (4) shown that medusae production is a repeated evolutionary event within the Hydrozoa, and (5) developed an experimental basis for the study of heterochrony.

INVENTIONS: None

PUBLICATIONS AND REPORTS: The following publications cite ONR support on this project.

1. Buss, L. W. and M. A. Shenk 1989. Hydroid allorecognition regulates competition at both the level of the colony and the level of the cell lineage. Pages 85-106 in Defense Molecules. J.J. Marchalonis and C. Reinish, eds. Wiley-Liss: New York.
2. Buss, L. W. and P.O. Yund. 1989. A sibling species group of *Hydractinia* in the northeastern United States. J. Mar. Biol. Ass., UK. 69: 857-875.
3. Buss, L. W. and R. K. Grosberg. 1990. Morphological variation, morphogenetic potential, and the regulation of competitive ability. Nature 343: 63-66.
4. Buss, L.W. 1990. Competition within and between clonal invertebrates. Trends Ecol. Evol., 5: 352-356.
5. Shenk, M. A. and L. W. Buss. 1991. Ontogenetic changes in fusibility in the colonial hydroid *Hydractinia symbiolongicarpus*. J. Exp. Zool. 257: 80-86.

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6. Buss, L. W. and N. W. Blackstone. 1991. An experimental exploration of Waddington's epigenetic landscape. Phil. Trans. Roy. Soc., Lond., 332: 49-58.
7. Blackstone, N.W. and L.W. Buss. 1991. Shape variation in hydractiniid hydroids. Biol. Bull., 180: 394-405
8. Cunningham, C. W., L. W. Buss and C. Anderson. 1991. Molecular and geological evidence for shared history in the symbiotic hydroid genus *Hydractinia*. Evolution, 46: 1301-1316..
9. Schierwater, B., M. Murtha, M. Dick, F. Ruddle, and L. W. Buss. 1991. *Antennapedia* class homeoboxes in cnidarians. J. Exp. Zool., 260: 413-416.
10. Schierwater, B., W. B. Piekos, and L. W. Buss. 1991. Hydroid stolonial contractions mediated by contractile vacuoles. J. Exp. Biol., 162: 1-21.
11. Buss, L. W. and M. Dick. 1992. The middle ground of biology; themes at the interface of development and evolution. Pages 77-98 in: *Growing Points in Evolution*. P.R. Grant and H. H. Horn, eds. Princeton Univ. Press: Princeton.
12. Bridge, D., B. Schierwater, C.W. Cunningham, R. DeSalle, and L.W. Buss. 1992 Class-level relationships in the Phylum Cnidaria: evidence from mitochondrial genome structure. Proc. Nat. Acad. Sci., USA 89:8750-8753.
13. Blackstone, N.W and L. W. Buss. (1992) Treatment with 2,4-dinitrophenol mimics ontogenetic and phylogenetic changes in a hydractiniid hydroid. Proc. Nat. Acad. Sci., USA, 89:4057-4061.
14. Cunningham, C.W., N.W. Blackstone, and L. W. Buss. (1992) Evolution of king crabs from hermit crab ancestors. Nature 355:539-542.
15. Cunningham, C.W. and L.W. Buss. (1992) Molecular evidence for multiple events of pedomorphic medusae reduction in the family Hydractiniidae. Biochem. System. Ecol., 21: 57-69.
16. Buss, L.W. (1994) Protocell life cycles. In: *Early Life on Earth*, S. Bergstrom, ed. Columbia Univ. Press, NY. In press.

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